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著者	Medved Primoz, Kim Jung In, Ursic Matjaz
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The urban social sustainability paradigm in Northeast Asia and Europe

A comparative study of sustainable urban areas from South Korea, China, Germany and Sweden

Primož Medved[1], Jung In Kim[2*] and Matjaz Ursic[3]
1 Faculty of Social Sciences, University of Ljubljana
2 Department of Architecture, Soongsil University
3 Faculty of Social Sciences, University of Ljubljana
** Corresponding author; Email: jungin@ssu.ac.kr*

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Abstract: In general, urban social sustainability has received little recognition in built environment disciplines. To comprehend the social dimensions of sustainable urban design, an understanding of urban planning features is required which takes into consideration the engagement of the local community. The article focuses on the impact that intense sustainable urban transformation has on localities in East Asia and Europe. The comparative research is based on a study of four large-scale urban sustainable cases in Northeast Asia (eco-cities "Sino-German Ecopark" in Qingdao, China; and "Pangyo" in Seongnam, Korea) and Europe (sustainable neighbourhoods "Vauban" in Freiburg, Germany; and "Hammarby Sjöstad" in Stockholm, Sweden). The research focuses on the connections and interactions between sustainable urban design and aspects of urban social sustainability. The paper represents an effort to unravel the social dimensions of eco-cities / sustainable neighbourhood projects by investigating how sustainable urban development is articulated and manifested in Europe and Northeast Asia. The final research output consists of the identification of sustainable urban design elements (e.g. community centres, plazas, parks and green zones, etc.) and policies (e.g. affordable housing accessible, public transportation, diversity of housing typologies, etc.) that could enforce the "urban social sustainability". The conclusive analysis offers a source of inspiration and potential policy orientations for cities that are in the process of sustainable transformation.

1. INTRODUCTION

In the last decade, the concept of the smart / sustainable / eco-city has become popular in wide-ranging debates on urban development and sustainability. Today's cities are now pursuing 'smartness' as a way to improve energy efficiency, transport, and public services (Haarstad, 2017). Several ambitious urban projects have emerged across the globe, which are completely in line with the sustainable development paradigm. These sustainable urban developments aim to improve urban infrastructure and local

services in an effort to create better environmental, social and economic conditions and to enhance cities' attractiveness as well as their competitiveness (de Jong et al., 2015). Large-scale urban (re)development projects, conceived on the basis of environmental sustainability, show how a city responds to the pressures and opportunities of globalisation. The approach of cities towards large-scale sustainable developments (i.e. eco-cities and sustainable neighbourhood projects) can thus directly affect both the global competitiveness and the image of the city on the international, economic and political scene.

de Jong et al. (2015) put forward that the terminology used for these new urban entities often combines very different signifiers, e.g. 'sustainable cities', 'green cities', 'liveable cities', 'digital cities', 'intelligent cities', 'smart cities', 'knowledge cities', 'information cities', 'resilient cities', 'eco-cities', 'low carbon cities', etc. Each of these terms apparently seeks to capture and conceptualise key aspects of ongoing urban sustainability efforts (de Jong et al., 2015). Ibrahim, El-Zaart, and Adams (2018) use the combination of two identifier / signifiers - "smart" and "sustainable" - to describe such urban development, although at the same time they recognise that "smart sustainable city" (in the scientific literature often referred to with the acronym SSC) is a fuzzy concept with no standardised terminology that can be comprehensively used to describe it. While exploring different urban sustainability concepts, Ahvenniemi et al. (2017) discovered that both terms are interconnected and often "smart cities" share similar goals to "sustainable cities". On the other hand, in their extensive scientific literature review, Bibri and Krogstie (2017) attempted to make a distinction between the concept of smart cities, sustainable cities and the trending concept of "smart sustainable cities", which the authors define as a "new techno-urban phenomenon". In general, various concepts, which refer to sustainable urban developments, are used inconsistently in the scientific literature (Ibrahim, El-Zaart, & Adams, 2018).

In this article, a mixed terminology of "eco-city" to describe the Asian sustainable / smart cities, and "sustainable neighbourhood" to describe sustainable / smart districts in Europe has been applied. The identifier "eco" for the particular Asian cities[1] and "sustainable" for the particular European neighbourhoods were chosen because it appears that these specific terms are the most often used in literature reviews, and not because of a concrete distinction of either expression.

The article will focus on the impact that intense urban transformations based on sustainable urban design have on localities in both East Asia and Europe. The comparative research is based on a study of four large-scale urban sustainable cases in East-Asia (eco-cities "Sino-German Ecopark" in Qingdao, China, and "Pangyo" in Seongnam, Korea) and the European Union (sustainable neighbourhoods "Vauban" in Freiburg, Germany, and "Hammarby Sjöstad" in Stockholm, Sweden). These particular case studies were chosen as they represent some of the most advanced large sustainable urban areas of Northeast Asia and Europe, which are globally the two most propulsive regions in terms of the development of sustainable cities. In particular, this research focuses on exploring the "urban social sustainability" dimensions in each case study. The social aspect of urban design is an integrated subject for investigation and it requires not only an understanding of urban design, but also of urban regeneration practices and community

[1] In China the term "sustainable" (in Chinese: "持續可能性") is rarely used in relation to cities. "Environmentally friendly" - Eco (in Chinese: "親環境") is more often used to describe urban environments.

engagement (Park, 2014). Social sustainability has received surprisingly little recognition in built environment disciplines (Monfaredzadeh & Krueger, 2015; Dempsey et al., 2011). Therefore, the aim of this article is to explore the urban social sustainability elements correlated with the sustainable urban design policies / elements in contemporary sustainable cities / neighbourhoods. It must be acknowledged that urban form and spatial development have major consequences on the sustainable development encompassing not only environmental issues, but also social and economic aspects (Keivani, 2010).

An analysis of selected projects will reveal some similarities between East Asian and European sustainable urban developments, but also important differences based on different socio-cultural contexts. In thinking about the future development of Northeast Asian and European cities, the results and materials from the research provide insight into contextual local particularities regarding both parts of the world and consequently foster a better implementation of sustainable urban projects in the long-term. The paper is an effort to unravel the comparable dimensions of eco-cities / sustainable neighbourhood projects by delving into the way in which the understanding of nature and urban development is articulated between Europe and Northeast Asia.

2. THEORETICAL BACKGROUND AND METHODOLOGY

The article focuses on a comparative analysis of international case studies regarding the most successful European sustainable neighbourhoods, and on Chinese and Korean eco-cities, which are already mostly built and populated, or are in their final implementation phase. It is very important to emphasise that in comparison to the extensive Northeast Asian eco-city projects (city scale), in terms of scale, the European cases are regarded as relatively small developments (neighbourhood scale). Because the development stage and size of the researched urban areas significantly differ from each other, it was decided to focus this research on comparable focal points. Firstly, a brief description of the context, background, and initial implementation process for each sustainable urban area will be introduced. Secondly, the basic urban concept of the analysed areas will be presented, which also represents the background for the final essence of the research presented herein. The final research output is the identification of the sustainable neighbourhood / eco-city design elements that have been implemented (or planned) in order to enforce and promote “urban social sustainability” (especially the local citizens’ sense of community). The main research aim is to examine and identify which concrete sustainable urban design elements were introduced in order to affect and stimulate social sustainability elements in European neighbourhoods and new eco-cities in South Korea and China.

Because we are comparing different urban scales (neighbourhoods and cities), we should mention two things. Firstly, the analysed eco-cities are treated in confined geographic boundaries and are relatively small (less than 100,000 population). Secondly, the neighbourhood scale of analysis is appropriate to determine the urban social sustainability attributes. In recent research, Larimian and Sadeghi (2019) identified that analysing urban social sustainability at the neighbourhood level has gained increasing attention in the recent years. They have recognized that ‘hard’ social sustainability attributes

(e.g. employment, poverty reduction) are being replaced by more 'soft' and intangible dimensions (e.g. social participation, sense of place), which could be analysed also at the neighbourhood (local community) scale. However, this shift of the social sustainability dimensions increases the complexity of the assessment, evaluation and interpretation of the concept (Larimian & Sadeghi, 2019).

A sense of community and belonging represents one of the crucial urban social sustainability factors (Dempsey et al., 2011) and should be stimulated in contemporary urban planning. Holistic and comprehensive planning, design and management effort are essential to create an ongoing sense of community (Kim, K.-B. & Lee, 2014). Deriving from the social doctrine of New Urbanism, Talen (1999) identified the main urban design elements that promote / enforce a sense of community within neighbourhoods / cities: "architecture and site design" to encourage social interaction; "density and scale" to promote commercial viability and to revive the public realm; "streets" to encourage street life; "multi mix spaces" to strengthen community bonds; and "public spaces" to enforce civic pride and a sense of place, which promotes the notion of community.

Changing social, political and economic conventions are as essential to the success of a city's resilience initiatives as is upgrading physical assets (Lee, 2017). Likewise, Wei et al. (2016) emphasised the importance of physical / environmental aspects in understanding the urban social sustainability concept. Dempsey et al. (2011) divided "urban social sustainability contributory factors" into two categories: "non-physical factors" (e.g. education and training, social justice, participation and local democracy, social inclusion, community, safety, fair distribution of income, cultural traditions, etc.), and "predominantly physical factors" (e.g. attractive public realm, accessibility, sustainable urban design, pedestrian friendly - walkable neighbourhood, etc.). Nearly all (physical and non-physical) urban social sustainability factors listed by Dempsey et al. (2011) are somehow interconnected, but this article will focus mostly on the interaction of a "sense of community and belonging" and "sustainable urban design". However, the interconnectedness of the different urban social sustainability aspects also induced us to explore other complementary factors such as social cohesion, social exclusion, accessibility, walkability, etc. Talen's New Urbanism doctrine and Dempsey et al.'s urban social sustainability concept represent the article's main theoretical frameworks and font of inspiration.

In regards to the aim of the article, a multistep methodological set of different approaches was applied. Firstly, the basic theoretical framework regarding social urban sustainability was established (Talen, 1999; Dempsey et al., 2011) in order to build a premise and content structure for further empirical research. Secondly, a comprehensive scientific literature review was done, which encompasses sustainable urban design and social sustainability issues for the four specific case studies. Thirdly, all four sustainable urban areas were visited by the authors, where an analysis of the local urban fabric and collected visual materials ("field research") was done. Fourthly, the main stakeholders of the four sustainable urban areas were interviewed. All the interviews were done in person (by the authors) at the specific sites. The interviewees / stakeholders were chosen based on their involvement in planning (city urbanists), local community engagement (e.g. the main representatives of local NGOs), and their expertise. In some cases, local business representatives were interviewed to gain everyday perspectives of the social dynamics within the local space. In total, 11 local stakeholders were interviewed.

More specifically, in Vauban - Freiburg in 2013, there was an opportunity to interview the "City Urbanist 1" (the urban planner of the Freiburg Municipality, who planned the entire sustainable neighbourhood), "NGO Representative 1" (the ex-leader of the community initiative Forum Vauban) and "Local Newspaper Editor 1" (former editor of the local newspaper Vauban Actuel). In Hammarby Sjöstad – Stockholm in 2014-2015, "NGO Representative 2" (co-planner of the "Hammarby Sjöstad 2020" community platform), "City Urbanist 2" (Urban planning sector of the Stockholm municipality), and "NGO Representative 3" (urban developer of the "Hammarby Sjöstad 2020" local platform) were interviewed.

Since the Sino-German Ecopark in Qingdao (China) is still under construction, it was not feasible to obtain responses from the residents. Instead, the builders of the new eco-city were contacted and interviewed in 2016. Interviews were conducted with the "Investment Manager 1" (Senior Investment Manager, Joint Venture Partnership, Qingdao International Economic Cooperation) and the "Technical Expert 1" (Professor in Qingdao Technological University). In the South Korean case study, several interviews were done between 2016 and 2017 as a prime source for better understanding the realities of the city. Besides the intermittent interviews with apartment residents, several interviews were conducted with "Real Estate Manager 1" (Building Manager in Pangyo Techno Valley office cluster) and with two local stakeholders, the owner of a Seven-Eleven 24-hour convenience store ("Shop Owner 1") in the residential complex of Pangyo and the owner of a large Korean restaurant in front of Pangyo Station ("Restaurant Owner 1"). These direct interviews and participatory observations became necessary resources to delineate the applied scenes of the "ecological concepts" and highlight differences from the advertised green urbanism in the Pangyo Techno Valley.

Finally, in the last section of the article, a comparative analysis of the different case studies will be presented, based on the data collected from the multistep methodological set. The focus of this comparison is based on identifying urban design elements that influence aspects of social-community (social cohesion, common goods, local identity and especially a sense of community) in the analysed urban areas. In the analysis seen in *Table 1* (Section 5), there is an extrapolation and comparison of particular urban design elements / urban policies, found in the doctrine of New Urbanism and Urban social sustainability, which have a positive influence in achieving social sustainability goals (a particular a sense of community). An analysis was done in order to understand which urban design elements / policies (see *Table 1*) have been implemented as an attempt to enforce urban social sustainability in each sustainable city and neighbourhood.

3. THE EUROPEAN PERSPECTIVE ON SUSTAINABLE URBAN PLANNING

Europe has a relatively long history in sustainable urbanism. Promoting urban sustainability has been a high priority for several European countries in the last decades. There is considerable evidence of the greening of city planning and development through Europe, but most especially in northern and western EU countries. In the comparative analysis, two of the most acclaimed best cases in sustainable urbanism are compared and analysed – the sustainable neighbourhoods of "Vauban" (Freiburg, Germany) and "Hammarby Sjöstad" (Stockholm, Sweden). These two particular cases were

chosen as each analysed sustainable neighbourhood had completely different, not to say opposite, implementation processes, but both have achieved excellence in sustainable urbanism.

3.1 Hammarby Sjöstad (Stockholm, Sweden)

Hammarby Sjöstad is the largest housing development undertaken by the city of Stockholm since the 1960s (Fraker, 2013). Together with the "Western Harbour" (Malmö) sustainable neighbourhood, they represent the worldwide acclaimed "Swedish sustainable neighbourhood development model". Hammarby Sjöstad is a typical brownfield development constructed from reclaimed industrial land. The initial impetus of the urban development of Hammarby Sjöstad began in the early 1990s as the demand for housing in Stockholm rapidly increased (Pandis Iverot & Brandt, 2011). Recognising that the project would require the expropriation of land; environmental remediation of contaminated soils; extensive reconstruction of infrastructure, including roads and new public transit, the city assumed the role of master developer (Fraker, 2013). Hammarby Sjöstad is therefore a typical example of the "top-down approach" in sustainable urbanism. While the neighbourhood plans were evolving, the city of Stockholm applied for the 2004 Summer Olympic Games and proposed the Hammarby Sjöstad area for the Olympic Village, with very high environmental standards. Stockholm was not awarded the 2004 Olympic Summer Games, but the policymakers and city planners did not back down from the proposed development project, and Hammarby Sjöstad, is now an internationally recognised model of sustainable urban planning (Bächtold, 2013). Once fully built, Hammarby Sjöstad will have 11,000 residential units for more than 25,000 people. About 35,000 people will live and work in the area (City of Stockholm, 2007). The project also comprises 400,000 m^2 for business (Bächtold, 2013).

3.1.1 Hammarby Sjöstad's urban concept overview

Hammarby Sjöstad is, above all, known for its globally acclaimed and copied "Hammarby eco-cycle model" of integrated environmental solutions.[2] Besides the eco-cycle, Hammarby Sjöstad's sustainable urban concept encompasses several sustainable solutions. In regards to green transportation, they developed an effective public transport system including trams, ferries, ethanol fuelled buses, hybrid car-sharing for residents, walking paths and bike lanes (Bächtold, 2013). However, the sustainable neighbourhood is still far from being "car free", and has many visible parking slots across the neighbourhood.[3] Car ownership per capita is relatively high[4] in comparison with some other European sustainable neighbourhoods.

The urban structure of Hammarby Sjöstad has a semi-open block system. The inner-city street dimensions, block sizes, building heights, density and functionality mix are integrated with a new openness, with views to water and parks (Bächtold, 2013). A special effort and emphasis has also been made in Hammarby regarding the "all-over connected green corridors" (interview with

[2] The eco-cycle handles energy, waste, water and sewage for housing, offices and other commercial activities in Hammarby Sjöstad. Hammarby Sjöstad implemented innovative technical solutions for energy supply and usage, a pilot sewage-treatment facility where new technologies are tested, and a practical automated waste disposal system for waste management (City of Stockholm, 2007).

[3] 0.65 parking spaces per 1 residential unit in Hammarby Sjöstad (Foletta, 2011).

[4] Car ownership is 210 per 1000 residents in Hammarby Sjöstad (Foletta, 2011).

"City Urbanist 2", 2015). A green avenue links the city district's green public spaces and forms green corridors, which run all the way through the southern part of Hammarby Sjöstad (City of Stockholm, 2007).

The urban form characteristics include the following (Fraker, 2013): typical inner-city street dimensions, high building density,[5] water views from public space and residences, several parks, multilevel apartments, large balconies and windows, etc.

Figure 1. Hammarby Sjöstad Masterplan model (Source: Authors, 2014)

From the outset, Hammarby Sjöstad set a very ambitious target for energy consumption - 60 kWh / m^2 per year, however, they later changed it to a more realistic target of 105 kWh / m^2 per year. After energy measurements were carried out in 2005, it was found that the average energy consumption was about 157 kWh / m^2 annually, which is far from the set goals (Fraker, 2013). The unexpected energy performance is the consequence of the apartment dimensions, which are bigger than average, and especially of the oversized windows, which result in heat loss (Bächtold, 2013).

3.1.2 The urban design elements that enforce Hammarby Sjöstad's urban social sustainability

The urban form of Hammarby Sjöstad was set to encourage a sense of community for local residents. The multi-functional purpose of local urban infrastructure, with a library, schools, health-care facilities, recreational facilities, restaurants, and local commercial establishments, stimulate a local sense of community (Fraker, 2013). A greater sense of community is also encouraged through programs and processes that promote social interaction and cultural enrichment (Gaffney et al., 2007). Cultural outlets in Hammarby Sjöstad include, for example, the "Fryshuset social and cultural centre" and the cultural institution "Kulturama" (City of Stockholm, 2007) interview with the "NGO Representative 3", 2014). The neighbourhood also provides a number of exercise and sports facilities, such as the Hammarbybacken slalom ski slope. For Hammarby Sjöstad, the green space system with numerous footpaths and bike paths alongside the canals represents a unique added value and the most frequented common space for social manifestation. Nearly every residential block is situated in the immediate vicinity of a park, each with its own characteristic identity, and in very short walking distance to the lake. The

[5] Population density is 131 persons/ha in Hammarby Sjöstad (Foletta, 2011).

lake has become an appealing resource, creating a unique sense of place (Fraker, 2013; City of Stockholm, 2007).

Figure 2. Hammarby Sjöstad's green public spaces (Source: Authors, 2014)

A very important urban design element, which is strongly correlated to the local identity and sense of place, is the neighbourhood community centre. Hammarby Sjöstad does not have a "real" community centre, but there is a special small environmental information centre, called "GlashusEtt", which performs many of the functions of a typical community centre. The GlashusEtt represents a meeting place for several local associations.

Figure 3. "GlashusEtt" in Hammarby Sjöstad (Source: Authors, 2014)

3.2 Vauban (Freiburg, Germany)

Vauban (Freiburg) is one of the most known and researched sustainable neighbourhoods in Germany. Vauban is a brownfield development, built on the area where ex-French military barracks had previously been situated. In contrast with the Swedish case study, Vauban is a typical example of a "bottom-up approach" in sustainable urbanism. After the French army left Freiburg in 1992, the initial plan of the city administration was to transform the abandoned, degraded area into a modern high-density residential neighbourhood (Sperling, 2000, 2002). At the same time, contemporaneously with the city planning for neighbourhood revitalisation, a group of young students (grouped in the S.U.S.I. movement) settled the empty Vauban military buildings, and initiated the innovative "Vauban green policy". S.U.S.I established a long-term social and environmentally sustainable vision for the

whole neighbourhood (Sperling, 2002)(Interview with the "NGO Representative 1", 2013). Over the years, with the expansion of the neighbourhood, the local residents established a new local grassroots community association called "Forum Vauban", which embodied a reference point and a link between all the neighbourhood associations, the municipality and local residents. Most individual blocks in Vauban were made up of small citizen cooperatives (in German, "Baugruppen") managed by Forum Vauban (Scheurer & Newman, 2009). Today, Vauban accommodates 5,000 people and offers around 600 jobs on 38 hectares.

3.2.1 Vauban's urban concept overview

Vauban is known for its numerous multi-residential passive houses created by the bottom-up cooperatives, its solar energy cooperatives and especially for its "car-free" zoning. The limited parking slots[6] are situated at the edge of the neighbourhood, hidden in the "Solargarage Vauban". In the absence of parked cars, these roads are used as social space, especially by children (Field, 2011). For this reason, and because of the very efficient public transport system (tram, bus) combined with the very popular car sharing system, car ownership in the neighbourhood is more than three times lower than the average German car ownership.[7] "City Urbanist 1", the main Freiburg urban planner at the time Vauban was being developed, wanted to "re-create a small medieval village, where all the services are available in front of the citizens' homes" (interview with the "City Urbanist 1", 2013). The Vauban planners' goal could be summarised by their moto "densely built, yet green".[8] The public green spaces are designed together in cooperation with the local residents. The greening of the public space is not limited to the grounds. Many of the "Baugruppen" employ vertical greening with different vegetation maintained by local residents (Fraker, 2013). Most of the residential buildings in Vauban are four or five stories. Buildings are restricted to 12.5 m in height for micro climatic reasons, but this also promotes sociability (Bradsky, Falk, & Birkbeck, 2008).

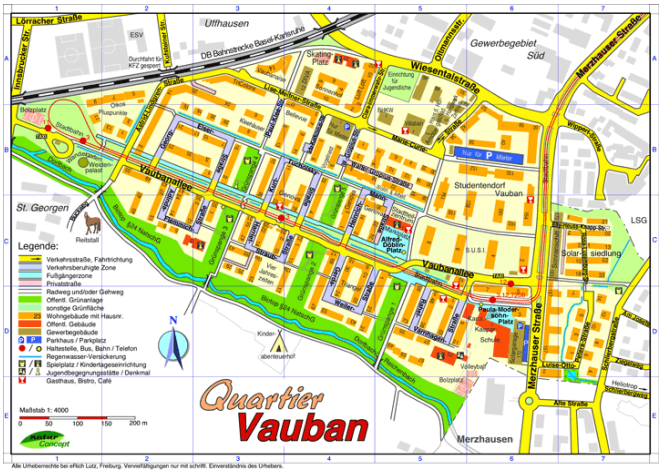

Figure 4. Masterplan of Vauban (Source: greenlivingpedia.org)

[6] Less than 0.5 parking spaces per one residential unit in Vauban (Field, 2011).
[7] Car ownership per 1,000 inhabitants in Vauban is 150. In the Municipality of Freiburg, the car ownership per 1,000 inhabitants is 427; and in Germany it is 517 (The World Bank, 2013).
[8] Population density (persons/ha) in Vauban is 122 (Field, 2011).

3.2.2 The urban design elements that enforce Vauban's urban social sustainability

The urban planners, together with local representatives, designed several urban interventions to promote the social and cultural dimensions of the neighbourhood, like a mixed-use district centre with shops for essential everyday purposes, a primary school and nursery school, child-friendliness in the design of public spaces, a neighbourhood centre for meetings and events, a multi-purpose district plaza, etc. (Fraker, 2013).

Unlike Hammarby Sjöstad, Vauban created an extensive, multifunctional neighbourhood community centre, called "Haus 37". Haus 37 has about 40 rooms, and represents the central focus point for the entire local community - the "heart of the neighbourhood". Haus 37 is the home of the popular "Süden" restaurant, a day-care centre for children, a meditation room, an art workshop, three benevolent associations, a kindergarten, a social worker's office, rooms for youth, the Vauban car-free association, the Forum Vauban association and the local magazine Vauban Actuel. The Vauban neighbourhood community centre is a perfect example of a central neighbourhood multi-functional facility with heterogeneous use of public space.

Figure 5. "Haus 37" in Vauban (Freiburg) (Source: Authors, 2013)

In Vauban, the planners designed and successfully implemented the central neighbourhood plaza – "Alfred Döblin Platz", which lies in front of the Haus 37 community centre. Twice a week there is a local organic farmers' market, once a month the local "exchange market" and each year there is also a neighbourhood festival. Other Vauban public spaces are represented by several green areas, parks, gardens and especially by the (almost) car-free residential streets.

Figure 6. Vauban's green public spaces (Source: Authors, 2013)

The urban form of Vauban and the socially oriented approach to housing development encourages more intensive, daily face-to-face contact between neighbours (Hamiduddin, 2015). However, this specific urban pattern is not for everyone and is in opposition to "modern urban anonymity", which also has its positive side. For a variety of reasons, there are people who prefer to be unknown individuals living anonymously in big cities (Bertaud, 2004).

4. THE ASIAN PERSPECTIVE ON SUSTAINABLE URBAN PLANNING

In Northeast Asian cities, the current elaboration of "ecology" is formulated by the recent adoption of state-led modernist urban planning. Within the phenomenon that is succinctly characterised by the term "city in a box", a number of eco-cities have now been planned and constructed. (Easterling, 2014) Here, city planning equates to building a marketable urban space often with extreme scale and speed and selling it like a highly profitable good. These spaces are often branded eco-cities, lavishly decorated with texts and images and full of rosy and futuristic blueprints. Along the coast of the Yellow Sea, these new neo-liberal cities are emerging as an answer to the region's rapidly deteriorating environment, the result of past industrialisation.

Cities in Pangyo (Seongnam, South Korea) and Sino-German Ecopark (Qingdao, China) illustrate concrete cases of attempts to build eco-cities in Northeast Asia. These new cities are said to be ecologically harmonious and technologically controlled. These cities trumpet the idea that ecology and sustainability can be the dominant strategy for development that produces a packaged urban space as well as a highly profitable example of contemporary urbanism. As a result, these new cities in South Korea and China illustrate how a regional application of ecology and sustainability to urban spaces creates a tendency for state bureaucracy, transnational developers and local entrepreneurs to utilise the eco-city concept as a metonym for on-going efforts of development and to create a contemporary urban space.

4.1 Pangyo (Seongnam, South Korea)

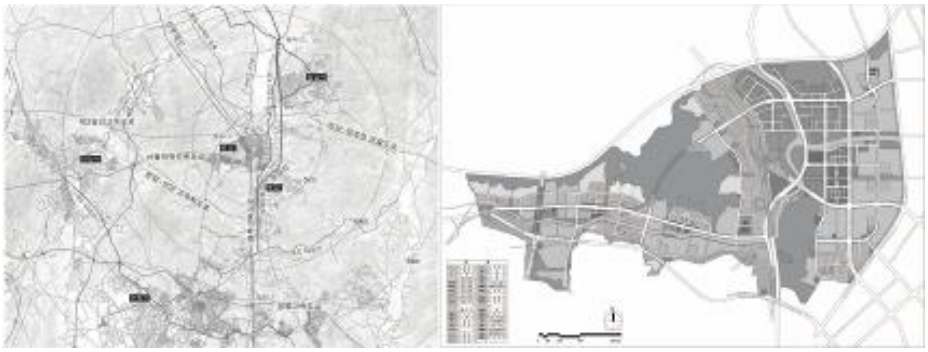

Figure 7. A map of Pangyo (left), plan of Pangyo (right)
(Source: Korea National Housing Corporation. URL: http://www.lh.or.kr)

At the southern tip of metropolitan Seoul, the Pangyo New City was planned for 30,000 households (approximately 90,000 residents) on the newly flattened area of 892 hectares (SungNam City Government, 2014). The new city was the result of a joint urban development project implemented by the

Gyeonggi Provincial Government, Sungnam City Government, the Korea Land Corporation and the Korea National Housing Corporation - all of these are a collection of governmental agencies at different levels (SungNam City Government, 2014). The morphology of the city was forced to adapt to external factors already in place. To the north, the city was separated by the military air base that rendered a direct connection to the southern tip of Seoul difficult. To the east, the 90's flagship new town Bundang is adjacent and packed with high density apartments. The already established buildings and natural topography of the valley have determined the entire urban fabric of Pangyo New City. Modern apartment complexes and commercial strips integrate in their design the specific local environment preconditions. New City also embraced the nation's first Gyungbu highway at its centre. Built in the 60s, this dominant infrastructure passes through the development from north to south, dissecting the city in two (*Figure 7*).

Unlike the 90's new town developments around Seoul, when newly created urban areas became satellite suburban commuter towns, Pangyo New City was not designed to be a commuter town, but to be a self-sufficient urban ecosystem, a future model with a new paradigm for city development, aiming to integrate long-term sustainability (B, 2000). In this ecological framework, the classification of "nature" was through a technocratic method such as "natural eco-function analysis" (Yonglok, 2013). In this framework, the circulation of material and energy flow in the city adopted a highly technical method in order to build a sustainable city that can connect the natural ecosystems. Likewise, mass Transit Oriented Development was introduced to help achieve the smart system of efficient transportation that became the backbone of the plan.

4.1.1 Pangyo's urban concept overview

Residential areas were planned with two distinct parameters: low to mid-rise apartments and single-family detached houses (*Figure 8*). Interpreting density this way, the plan radically departs from the high-density, tall apartment towers constructed in Seoul over the past four decades of industrial urbanisation. Between distributing low-density residences and preserving the ecological environment, nature was introduced here as a vital complement to the development and presents itself as space for a comfortable lifestyle. However, while the residential development aimed at creating green and leisurely surroundings, the horizontally planned expansion of urban boundaries inevitably destroyed undeveloped natural areas, otherwise saved by vertical development (Graham, 2016; Owen, 2009; Kim, R., 2001). This innate contradiction intensified when the city put forth an agenda of economic sustainability by embracing both low-density and affordable housing.

Figure 8. 'Single family homes' (left), 'low to mid-rise apartments (right)
(Source: Authors, 2016)

The initial plan was to make distinct categories for preservation that could utilise the land at different zones and intensities and "to maximize the existing natural ecosystem and circulation"(Kim, H. W., 2007). To this end, a special environmental assessment was undertaken to monitor water utilisation and the river environment, plains and green areas, insects, fish, amphibians, reptiles, birds and mammals. Ecological conditions related to energy circulation and material circulation were also measured. With a controlled list of species and a categorical eco-system, the new city plan developed a particular attitude towards nature. The choice of its preservation was both absolute and relative. The absolute preservation was intended to keep nature as it is. In contrast, the relative preservation engaged with the more active side of planning through designing parks and green leisure areas. In a significant way, this planned preservation also implied that the commercial and residential zones needed to be combined in order for the area to be functional. The relative preservation area took up almost one third of the entire development (*Figure 9*).

Figure 9. Green areas combined in commercial and residential zones
(Source: Authors, 2016)

4.1.2 The urban design elements that enforce Pangyo's urban social sustainability

The paradigms of "socio-economic balance" and "sustainable self-sufficiency" represent important aspects of the urban social sustainability concept. They are mostly manifested in the zone called "Pangyo Techno Valley" (*Figure 10*) - an area northeast of the city designated to attract high-tech start-ups, research labs and information technology offices (Kim, S. E., 2016). Establishing lucrative knowledge-based industries, small-scale custom manufacturing, and research-oriented production helps the city to be globally attractive. In addition, the new city plan aspired to be independent of the economic concentration on a few central sites of the larger metropolitan Seoul. In this sense, the Pangyo Techno Valley and business districts were a response to the city builders' quest for self-sufficiency. By setting up the zones of commercial and business function, Pangyo took into consideration the various problematic issues of past satellites towns and countered the ubiquitously repetitive practices of building apartments only suited for commuter-town suburbia.

Figure 10. A map of Pangyo "Techno-Valley" (left), Pangyo "Techno-Valley" (right) (Source: Authors, 2016)

On the other hand, the grouping of "naturalness" measured by the intensity of intervention (planning) was very much a categorical interpretation of ecology vis-a-vis urban function. In other words, preserved nature often simply meant spaces left undeveloped due to mountainous topography or land unsuitable for the construction of the city (Kim, G., 2005). The degree of preservation and the ecological function of nature was thus understood not as intricate and complex networks with man-made urban elements, but as the economic utility of available urban land. Rather than inter-connectedness between the existing (natural) landscape and the urban environment, functional land use brought on by top-down planning and the technocratic understanding of ecology were illustrated here. Among the examples, the most visible was the broad driveways that were made over scaled superblocks ubiquitous in the city. This modernist approach resulted in high walls that were put up to fend off traffic noise and intensified the isolation of each residential superblock. Residents were supposed to live in an interconnected "ecological" environment, but they were disappointed with the high level of traffic noise and walkways splintered by the wider motorways. In the Pangyo "Eco" city, the real bottom-up voices were raised not from the participatory planning during the process, but from the angry protests of the residents after the conclusion of the project via top-down planning (Figure 11).

Figure 11. News article on the high level of traffic noise (left), high soundproof walls along the road (right) (Source: Authors, 2016)

4.2 Sino-German Ecopark (Qingdao, China)

Since the introduction of its open door policy from 1979, China has shown an unprecedented level of urban growth over the past three decades (Wu & Gaubatz, 2013). After experiencing the urban development characterised by unreasonable speed and a megalomaniacal scale, China is now pushing the idea of sustainable urban design. The new concept seemed to gain a status of urgency, seemingly the only way to ease the international climatic anxiety, as well as the domestic environmental concerns that trouble the nation. Today, 14 provinces and 150 counties in the country have embarked on various programs and planning for ecological new towns, often called "eco-cities".

Thus, the development for eco-cities in China shows its new direction towards the next stage of urban development (Shapiro, 2016).

What is distinct about the eco-city constructions in China is that they have been developed in collaboration with other countries, hoping to learn from the advanced technologies and infrastructure of others. The collaboration which took place building new cities such as Sino-Sweden Caofeidian Eco-City in Tangshan, Sino-Finnish Mentougou Eco-City in Beijing, Sino-UK Dongtan eco-city, and Sino-Singapore Tianjin Eco-City (SSTEC) are among the most well-known. This trajectory of joint ventures towards green-urbanisation brings yet another signature eco-city project, the Sino-German Eco-park in Qingdao (Shepard, 2015; Sze, 2015).

Qingdao is located in eastern Shandong Province on the east coast of China, where the Germans have left a strong colonial legacy, not only in the well-known beer industry of Tsingtao, but also to numerous construction projects in the city (Steinmetz, 2008). In the special link to Germany that had laid the foundation for the city's modern infrastructure at the turn of the century, a strategic partnership was developed as well. This happened in a way that allowed the Chinese government and their planning experts to continue acquiring the most updated sustainable urbanism through the German approach. Having environmental concerns somewhere between a sustainable urban future and the socio-economic challenges of globalisation, Chinese planners in Qingdao chose German experts as good strategic partners. In turn, these German experts influenced the development of eco-city, both in concept as well as practise.

In 2009, a joint effort was formed between China's Ministry of Commerce and Germany's Federal Ministry for Economic Affairs and Energy. Since then, experts from both countries envisioned a project for collaborative and futuristic urban space. This ultimately led to the establishment of Sino-German Ecopark in Qingdao. In this context, the new sustainable city in Qingdao was elevated as a symbol of economic cooperation between the two countries.

The New Area of Huangdao (Yellow Island) is the site for the new city. It is a part of the International Economic Cooperation Zone and now keeps Qingdao's (Blue Island) metropolitan growth towards the west. Setting up Huangdao as the grounds for large urban development and a counterpart to the existing city of Qingdao is intended to help the broader Qingdao region as a whole to emerge as one of the major metropoles in the nation. By going through several international competitions, the Chinese officials selected a German architectural office that proposed the final design of the city on the Huangdao site (de Jong et al., 2013). When completed, the new eco-city will have an approximate area of 70 square kilometres, hosting a population of 60,000.

4.2.1 Sino-German Ecopark urban concept overview

The new city is characterised by diverse land-uses that promote the combination of living and working within the prescribed parameters of ecological principles and closer social interaction. The urban zones mainly cover three urban functions. Here, a high-technology industrial zone, research and development zone (45%) and commercial-residential zone (25%) are established within parks and green infrastructure (30%). These three urban zones are again divided into nine so-called "cell quarters" - "Urban Blocks of living organisms". For example, in a cell quarter, which is being constructed as a commercial zone, the German Business Centre was built under the

national green architecture standard (the Chinese Green Building Certification Program) as well as the DGNB (German Sustainable Building Council) green standard. The German Business Centre is being completed as a benchmark of early stage sustainable development in Sino-German Ecopark. The sustainable and biological metaphors are employed throughout the branding of the project and represented by this iconic building. As such, the application of the organic and living mechanism to the entire plan serves as an organising principle by which each cell quarter can autonomously generate parks, squares and promenades. Residents in each cell can walk to any place comfortably and bike from the centre to the edges of the quarter in 10 minutes. In addition, all nine cells are connected (Figure 12) by water passages that originate from artificial lakes, creating networks of nature (information from the on-site videos (Administrative Committee of Qingdao International Economic Cooperation Zone, 2016; Management Committee of the Sino-German Ecopark Qingdao, 2016).

Figure 12. Sino-German Ecopark Masterplan model (Source: Authors, 2016)

4.2.2 The urban design elements that enforce Sino-German Ecopark's urban social sustainability

Through experience gained from other projects in China, the selected German design firm laid out a master plan in order to create a high-quality urban lifestyle and ecological environment that respects Qingdao's unique landscape. The cell quarters in the Sino-German EcoPark are intended to promote more sustainable urban conditions and subsequently to achieve social cohesion. For example, in cell quarter "E", a designated residential area called "Happy Community" is being constructed. Here, harmony of social life is realised with sustainable urban development that takes into consideration family-oriented residences. This housing development will become home to more than 2,500 households for over 7,000 residents. In cell "F", the German Fraunhofer Institute is currently planning strategies and a procedural evolution of ecological urban life for the so-called "City of Tomorrow". Building ecological urbanism disregarding the existing human and natural conditions, the extensive tabula-rasa approach to the Sino-German Ecopark, presupposes an imagined community symbiotically integrated and merged with a perfect techno-scientific ecology, a managerial (human) rationality that supports a total-control of nature that is yet to come. The deterministic idea that a good design covered with biological concepts and verdant ecology will ultimately bring harmonious urban life illustrates a peculiar interpretation of the term "ecology", now universally applied to the design of a new city. The Sino-German EcoPark is planned as an isolated future city, an inverted version of

truer ecology in which a perfect city is detached from the existing networks. Ecology is used as an effective tool for development by updating contemporary modernist planning. The orthogonal modernist city now turns into a cell-shaped curved version where ecology is the primary element to be marketed and branded. As a result, sustainability and ecology become objects to be managed as a newly produced entity that purportedly anticipates a better life and a harmonious society.

Figure 13. "Happy Community" (Source: Authors, 2016)

5. DISCUSSION

In today's sustainable urbanism, green technologies and other aspects of environmental sustainability have prevailed over economic and especially social sustainability. For this reason, it was decided to explore and research the social sustainability manifestation in the analysed sustainable urban developments in more detail. The theoretical background of the comparative analysis was based on urban social sustainability indicators, inspired by the New Urbanism paradigm (Talen, 2002, 1999) and the particular physical and non-physical contributory elements related to the concept of urban social sustainability (Dempsey et al., 2011). Both theoretical frameworks attempted to delineate how specific urban design elements and urban policy stimulate social sustainability. The two theoretical frameworks inspired the research for the comparative analysis of the four case studies (see *Table 1*), where several comparable aspects / indicators were set regarding urban design elements that influence social (community) goals and in particular, a sense of community. It must be acknowledged that most of the sustainable urban design elements that enforce social sustainability have, to a certain extent, been implemented (planned), or at least partly considered in all four case studies (*Table 1*).

Table *1*. Urban design elements influencing social (community) goals: International case study comparison

Sustainable urban development area / ***Urban design element and policies associated with a sense of community, local identity and "common goods"***	***Vauban (Freiburg, Germany)***	***Hammarby Sjöstad (Stockholm, Sweden)***	***Sino-German Ecopark (Qingdao, China)***	***Pangyo (Seongnam, Korea)***
Communal areas maintained by citizens	Yes	Partly	Yes	No
Compact, high density urban areas	Yes	Yes	Yes	Yes
Mixed use ("balanced") urban development (commercial/residential)	Yes	Yes	Yes	Yes

Concentration of commercial, civic and institutional activities	Yes, along Vaubanallee	Yes, along Hammarby Allé	Yes	Yes, along Pangyo Subway station
Neighbourhood community centre	Yes, "Haus 37"	Yes, "GlashusEtt"	Yes, planned but not yet realised	Yes, near apartments
Walking distance (max 5min) to the local commercial amenities, civic institutions, etc.	Yes	Yes	Yes	Partly, 10-20 min
Historic preservation of traditional urban patterns	Yes (all ex-military barracks)	Partly (the "Luma factory")	No, all urban elements are new	No, all urban elements are new
Affordable housing	In decline	In decline	No	No
Accessible public transportation	Yes, tram and bus stops in the centre of the neighbourhood	Yes, tram and bus stops in the centre of the neighbourhood	Yes	Yes, subway and bus stops in the centre of the neighbourhoods
Aesthetic and ramified walking and biking paths	Yes	Yes	Yes	Yes
Diversity of housing types	Yes	Yes	Yes	Yes
Clearly defined borders and centre	Yes	Yes - borders; partly - centre	Yes	Yes - centre; partly - borders
Neighbourhood parks and green zones	Yes, many	Yes, many	Yes, many	Yes, many
Streets designed primarily for pedestrians	Yes	Partly, there are limited parking zones and car-free zones	Not yet planned	Partly, there are limited parking zones and car-free zones
Public plazas	Yes	Yes	Yes	Yes
Cultural and sport activities / amenities	Yes	Yes	Yes	Yes

The two Asian eco-cities and the two European sustainable neighbourhoods have attempted to introduce several urban design elements completely in line with the New Urbanism paradigm and the concept of urban social sustainability, e.g. compact high density, (balanced) mixed use of commercial and residential areas, concentration of commercial, civic and institutional activities, accessible public transportation, walking and biking paths, diversity of housing, public plazas and neighbourhood centres, cultural and sport activities / amenities, etc. A special effort was made in the development of several green areas and parks that have been promoted and implemented in all the studied sustainable areas. For all the previously mentioned reasons, it is possible to affirm that current modern sustainable / eco-cities have moved away from the suburban, unsustainable, residentially disperse and non-functional urban patterns common in the last half century.

However, it was identified that in the two European sustainable neighbourhoods examined in this paper, the urban planners introduced more specific urban design elements that stimulate a sense of community. In particular, regarding the implementation of car-free streets and public spaces created entirely for pedestrians and cyclists, it seems that this is more a European prerogative. The very much discussed and criticised highway in the middle of the Pangyo eco-town, is a perfect example that the concept of a "pedestrian walk-way" is still far from being introduced in Asian eco-cities.

The two European neighbourhoods are typically representative of brownfield development, therefore they (had to) take into account the historic urban heritage within the urban planning of the new urban zone. On the contrary, the two Asian eco-cities have much more freedom in urban experimentation in which the grander scale and the magnitude of efficacy have

been the main focus of its "eco"-solution. In other words, they constructed an image of efficiency and functionality out of infrastructural aesthetics that enabled such massive and speedy investments to make "eco"-cities. In the Pangyo Techno-Valley and Sino-German Ecopark, major concerns were not a piecemeal process of resident participation. Distancing the social agenda that has the potential to bring a sense of community or relieve the pressure of economic disparity, state efforts stayed in a rather "neutral" and technological outlook on space. That is, those Asian eco-cities retained the pervasive techno-managerial paradigms, which emphasised the efficient, programmatically segregated, and techno-sentient built environment that presupposed the dramatic alteration of existing nature and society. In the tabula-rasa overlaid in the modernist-fashioned wide motorways, the wholesale city making efforts with their gargantuan scale subsequently granted the obsolete, but long-established, view of the city as an enclosed spatial envelope within a controlled circuit of time. The definition of eco-city, in this sense, was an "object" to be manufactured in a given period via a top-down process as well as a masterminded "elite product" to be marketed to other large investors. Implanted as part of the state-driven spatial apparatus for economic reasons, "eco" is a prefix meant to be a celebratory self-affirmation to rationalise a techno-utopic paradigm as well as a fashionable marketing strategy to attract global capital.

The pronounced issue in all four analysed cases is the excessive prices of the eco-apartments, which is not just the consequence of more expensive sustainable building materials. Expensive houses and high rents are common for these specific eco-urban cases and seem to represent a prerogative for most sustainable urban areas across the globe.

6. CONCLUSION

In some respects, it was challenging to make a comparison of such diverse urban developments, which are extremely different in size (neighbourhood level: Vauban and Hammarby Sjöstad; city level: Sino-German Ecopark and Pangyo), development phase (Sino-German Ecopark and Pangyo are now in the process of construction) and initial development site (greenfield developments in the Asian cases; brownfield developments in the European cases). However, the article's comparative analysis is relevant due to recent trends in eco-city design. The four analysed case studies are among the well-known and celebrated examples of sustainable urban developments in their region and represent the role models in sustainable urbanism at national and international levels. All the analysed cases indicate a concrete direction, which will be, or is already, followed by cities across the globe. The analysed innovative sustainable urban developments represent the laboratories of urban innovation ("EcoUrbanLabs") for the world's future cities. In all the analysed cities / neighbourhoods the innovative sustainable / green technology is tested, and in the future will be implemented in other urban realities across the globe. In addition, it must be acknowledged that the analysed sustainable neighbourhoods and eco-cities implemented several concrete sustainable urban design elements, which affect the communities' social sustainability (e.g. multi-functional local urban infrastructure – essential basic local services like library, schools, health-care facilities, local commercial establishments; cultural amenities, carefully built green areas, neighbourhood community areas, etc. – see *Table 1*). Although there has been widespread criticism pointing to the preferential planning focus on predominately technological and

not social aspects, it was possible to find some concrete evidence that in the four analysed sustainable neighbourhoods / cities there has also been a tangible effort to implement community-building related urban design elements.

Finally, from an overview of current international sustainable developments, it can be stated that new sustainable urban development across Europe and Asia, apart from the environmental technical solutions, have also integrated several urban design solutions that have attempted to enforce a sense of community, and at least tried to contribute to urban social sustainability (in general). There is still much to be done and improved upon, however. As mentioned, two of the most complex issues facing current sustainable urban developments across the world are "eco-elitism" and "eco-gentrification", meaning that just the most affluent, educated and sustainability conscious citizens of the upper-middle creative class populate new sustainable districts (Medved, 2018). Unfortunately, in regards to the social sustainability urban policy "how to introduce and maintain affordable housing (contrasting gentrification)", all of the analysed case studies (European and Asian) have failed. Apart from the hi-tech urban design of new eco-cities / sustainable neighbourhoods, it also appears necessary for the immediate future to discover a mechanism (concrete urban policy) regarding how to keep the prices of green developments low enough in order not to create gentrified areas.

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